

VU Research Portal

Exposing Information Sharing as Strategic Behavior and Encouraging the Sharing of Private Important Information

Balau, N.

2017

document version

Publisher's PDF, also known as Version of record

[Link to publication in VU Research Portal](#)

citation for published version (APA)

Balau, N. (2017). *Exposing Information Sharing as Strategic Behavior and Encouraging the Sharing of Private Important Information: The Role of Motivations, Cognitions and Technological Features*. [PhD-Thesis - Research and graduation internal, Vrije Universiteit Amsterdam].

General rights

Copyright and moral rights for the publications made accessible in the public portal are retained by the authors and/or other copyright owners and it is a condition of accessing publications that users recognise and abide by the legal requirements associated with these rights.

- Users may download and print one copy of any publication from the public portal for the purpose of private study or research.
- You may not further distribute the material or use it for any profit-making activity or commercial gain
- You may freely distribute the URL identifying the publication in the public portal ?

Take down policy

If you believe that this document breaches copyright please contact us providing details, and we will remove access to the work immediately and investigate your claim.

E-mail address:

vuresearchportal.ub@vu.nl

Chapter 2

Bălău, N., & Utz, S. (under review). Information Sharing as Strategic Behavior: The Role of Information Display, Social Motivation and Time Pressure. Earlier versions of this paper have been presented at the 63rd Annual Conference of the International Communication Association (ICA), London (United Kingdom), 17–21 June 2013 and at the Annual Conference Het Etmaal van de Communicatiewetenschap (24 Hours of Communication Science), Rotterdam (The Netherlands), 3–4 February 2013.

Chapter 2

Information Sharing as Strategic Behavior: The Role of Information Display, Social Motivation and Time Pressure

In today's knowledge economy, given the increasing number of online collaborative platforms, it is even more important to understand and manage the sharing of information. Although it is widely accepted that technological design affects how people use a platform, it is a real challenge to constantly stimulate information sharing (IS), also because individuals often behave strategically, i.e., share relatively unimportant information, but keep the important private information for themselves. This research aims to understand how people's motivations and aspects of communication technology interact to affect IS. Specifically, we expand the view of IS as strategic behavior by investigating 1) how social motivation (prosocial vs. proself) and time pressure (high vs. low) interactively impact strategic IS and 2) how technological features (push- vs. pull-information display) can increase the sharing of private information. Across two experiments, we found that push-information displays increase the sharing of private information. This held especially for individuals with a prosocial motivation. Additionally, we found that actual and not perceived time pressure impacts (private) IS. Implications for technological design choices and knowledge management are discussed.

Keywords: strategic information sharing, technological feature, push-information display, pull-information display, social motivation, time pressure

2.1. Introduction

Oftentimes perceived as power, knowledge is a precious intangible asset and key to competitive advantage (Davenport & Prusak, 1998; Grant, 1996). In our knowledge economy, the increasing number of online collaborative platforms is progressively dependent on individuals' information sharing behavior. Organizations, for instance, invest in technology, in knowledge management systems, to facilitate and encourage knowledge sharing. However, many knowledge sharing projects fail because people often tend to keep important knowledge to themselves (Akhavan, Jafari, & Fathian, 2005), sharing more often information that is generally known (e.g., Stasser & Titus, 1985). We argue that this is because information sharing is strategic behavior influenced by *motivations* and want to investigate whether *technology* can help to overcome this problem.

Steinel, Utz, and Koning (2010) developed the *information pooling game* to investigate the impact of *social motivation* on strategic information sharing such as sharing several pieces of relatively unimportant information but keeping the important private information for oneself. Using different reward systems to manipulate social motivation, they found that individuals with a prosocial motivation shared more private and more important information than individuals with a proself motivation who strategically shared public and unimportant information to create a cooperative impression and concealed or even lied about their private and important information (Steinel et al., 2010). Firstly, our aim is to extend this line of research on the role of motivational processes by testing the generalizability of these findings from an abstract lab experiment to a more complex setting involving more and actual information. Secondly, we want to examine the role of time pressure as a situational factor. The practical justification for considering time pressure is that in our fast-paced society, people often have to make decisions under time pressure, and especially then the sharing of tacit or private information would be relevant. From a theoretical perspective, previous research has shown that time pressure lowers decision quality in groups, in the lab as well as in actual teams (Bowman & Wittenbaum, 2012; Chong, Van Eerde, Rutte, & Chai, 2012; De Dreu, 2003), supposedly because time pressure increases the need for cognitive closure

(NFCC), i.e., the desire to reach quick decisions in ambiguous situations (Webster & Kruglanski, 1994). Moreover, the motivated information processing in groups (MIP-G) model (De Dreu, Nijstad, & Van Knippenberg, 2008) predicts that social motivations and epistemic motivations such as NFCC, separately and, most importantly, in interaction, affect information processing and sharing in groups. However, these predictions have not been tested in the domain of strategic information sharing (SIS) yet. The present research is going to fill this gap. Thirdly, building on research that stresses the role of technology as opportunity next to motivational factors (Ketinger, Li, Davis, & Ketinger, 2015), we examine whether a push design (vs. a pull-design) can increase the sharing of private important information. Web2.0 technologies (e.g., social networking sites) push information into newsfeeds or streams and offer more subtle sharing options (e.g., ‘Share’ buttons). Sophisticated information push-delivery systems based on intelligent search technologies can provide tailored, important information, matching predefined criteria (Pedley, 1999) or users’ preferences (Chen & Tai, 2003), whereas pull information systems require much more time and effort to find relevant information. How information has been accessed might also influence how readily it is shared; hence, we investigate, interactively, the role of technology, social and epistemic motivations. In the following sub-sections, we elaborate on what SIS is and review the most relevant literature on social motivation, time pressure and technological features.

2.1.1. Strategic Information Sharing

The studies using the traditional information sampling paradigm (Brodbeck, Kerschreiter, Mojzisch, & Schulz-Hardt, 2007; Schulz-Hardt, Brodbeck, Mojzisch, Kerschreiter, & Frey, 2006; Stasser & Titus, 1987; Wittenbaum, Hollingshead, & Botero, 2004) explain information sharing behaviour as a consequence of cognitive biases (Mesmer-Magnus & DeChurch, 2009; Reimer, Reimer, & Czienskowski, 2010; Stasser & Stewart, 1992; Stasser & Titus, 1985). In this respect, a fairly large body of research (e.g., Osatuyi, Hiltz, & Fjermestad, 2012; Stasser & Titus, 1987; Stasser, Vaughan, & Stewart, 2000; Winquist & Larson, 1998) showed that people are more likely to share information that is known to all members than information that is unique (i.e., known by one/some

member(s) only). Although empirical research has largely studied information sharing in cooperative contexts, in these studies, it was not possible to disentangle cognitive and motivational processes. When an individual said (s)he did not share a piece of information because (s)he did not consider it as important, it was unclear whether this is really true (a cognitive bias) or whether this is just a self-justification of strategic withholding of information. Previous research has also shown that people lie, deceive (Steinel & De Dreu, 2004) and spin preference-consistent information, indicating that motivational aspects also play a role in information sharing (Scholten, Van Knippenberg, Nijstad, & De Dreu, 2007). Our focus is on these motivational aspects underlying strategic information sharing and we use a new paradigm developed by Steinel et al. (2010) to study SIS. More specifically, we investigate how motivational aspects affect especially the *quality* but also the *quantity* of information individuals share.

Strategic information sharing has not been explicitly defined in prior papers (Osatuyi et al., 2012; Steinel et al., 2010; Toma & Butera, 2009), although they all studied information sharing in mixed-motive situations. We understand SIS as *the individual behavior of deliberately sharing a particular type of information as a motivated response to an implicit expectation (or explicit request) of sharing information*. Thus, we focus on situations such as team decision making where members – for example, because they bring in different expertise – are expected to share at least some information. We further assume that team members are aware of the value of the information they (privately) own. For instance, individuals may consciously and deliberately choose to share important and private information positively impacting the collective outcome or unimportant information just to make cooperative impressions, not contributing at all or even worsening the collective outcome.

2.1.2. The Effects of Social Motivation on Information Sharing

In their information pooling paradigm, Steinel et al. (2010) varied the importance (important vs. less important) and sharedness (public vs. private) of information. Each participant had 12 pieces of information, 6 private (from their own network) and 6 public (e.g., from the internet); half of the information was

labeled as important, the other half as less important. Subjects were presented only with labels (e.g., information #424, important, private) and not with actual information (Steinel et al., 2010). If a person in this situation does not share the private important information, it can only be due to motivational reasons, but not due to a cognitive bias such as misjudging the importance of a piece of information. By telling participants how many pieces of information were needed to solve the task at hand, an anchor for cooperative behavior based on the equality norm was created (Messick, 1993). The findings showed that individuals' social motivation (prosocial vs. prosself) affected both the amount – i.e., a main effect of social motivation indicated that prosocials shared more information than proselves – and *type* of information shared – i.e., interaction effects between social motivation and information importance and sharedness, respectively, indicated that prosocials shared more private and more important information than proselves who strategically shared more of their public and unimportant information – inspiring new directions researching information sharing as *strategic behavior* (Osatuyi et al., 2012; Steinel et al., 2010; Toma & Butera, 2009). We want to test the generalizability of these findings in a more complex situation with more and actual information. We expect to conceptually replicate the basic and most-relevant-to-SIS findings of Steinel et al. (2010):

H1: Prosocials¹ share more information than proselves.

H2: Prosocials share more a) private and b) important information than proselves.

¹ Social motives can either be due to individual differences in social value orientation (SVO) (Van Lange, Otten, De Bruin, & Joireman, 1997) or may be situationally cued, for instance, by providing group or individual incentives for performance (De Dreu, Nijstad, & Van Knippenberg, 2008). Empirical studies that either manipulated (Steinel, Utz, & Koning, 2010; Toma & Butera, 2009) or measured (Utz, Muscanell, & Goeritz, 2014) social motivation brought consistent evidence to demonstrate that information sharing is strategic behavior. Conceptually, it should not therefore matter whether social motivation is chronically or temporarily salient. For simplicity reasons we use the terms 'prosocials' and 'proselfs' although we manipulate social motivation.

2.1.3. The Effects of Time Pressure on Information Sharing

Either in offline or in online work settings, people are expected to make decisions under time pressure and in the presence of deadlines. Time pressure detracts individuals from their core responsibilities (Van Den Hooff, 2012) and a large body of literature has shown that it negatively impacts performance (e.g., Bowman & Wittenbaum, 2012), the quality of decision-making (e.g., Edland, 1994; Hahn, Lawson, & Lee, 1992; Scholten et al., 2007), negotiation outcomes (e.g., De Dreu, 2003) etc. These studies did not explicitly measure information sharing, but decision quality or negotiation outcomes depend on the type of information shared. Thus, there is some indirect evidence that time pressure influences information sharing. Furthermore, time pressure is one of the reasons for not sharing enough information (Ko, Kirsch, & King, 2005; Li, 2010). For instance, studies on virtual teams (e.g., Lipnack & Stamps, 1997; McGrath, 1990) have repeatedly found that time constrains influence knowledge sharing and its antecedents such as trust, and relationship building (e.g., Jarvenpaa, Knoll, & Leidner, 1998; Jarvenpaa & Leidner, 1999; Li, 2010).

It can be expected that less information is shared when there is less time to do so. However, there is also a more psychological explanation. Time pressure is supposed to increase individuals' NFCC, i.e., the desire to reach quick decisions. NFCC is defined as a person's motivation with respect to information processing and judgment (Webster & Kruglanski, 1994), it is one of the main antecedents of epistemic motivation and it depends on the perceived sufficiency of the information that is already available to the decision maker (De Dreu et al., 2008). According to the MIP-G model (De Dreu et al., 2008), besides social motivation, epistemic motivation also influences information processing in groups. People who want to come to a quick decision are less motivated to elaborate and discuss many pieces of information, ignoring multiple perspectives to a given issue and will therefore also share less pieces of information. Our next hypothesis is therefore formulated as follows:

H3: People under high time pressure share less information than people under low time pressure.

No study to date examined the joint impact of social motivation and time pressure on SIS. Also in line with the predictions of the MIP-G model, we argue that high time-pressure would lead to a smaller effect of social motivation on IS. SIS assumes that people carefully process information and decide strategically which pieces of information they want to share, depending on their current goal. Under high time pressure, individuals are less able to process all the information and make the decisions about the best strategy. Under low time pressure, individuals have all the time to think carefully about which pieces of information to share, the effects of social motivation should be stronger under low time pressure:

H4: The effect of social motivation, i.e. that prosocials share a) more private and b) more important information than proselves, is more pronounced under low time pressure than under high time pressure.

2.1.4. The Effects of Technology on Information Sharing

Motivation is an important factor explaining SIS. However, to better understand the sharing behavior, technology also needs to be considered since it constitutes the opportunity to share information (Ketinger et al., 2015). Previous research argues that technology may either enable or hinder online information sharing (Hsu & Lin, 2008; Paroutis & Al Saleh, 2009) but most of the empirical literature considered technology from a broad perspective: a database context (e.g., Bordia, Irmer, & Abusah, 2006), computer-mediated communication (e.g., Van Den Hooff & De Ridder, 2004), knowledge management systems (e.g., Cabrera, Collins, & Salgado, 2006), social media platforms (e.g., Vuori & Okkonen, 2012), or electronic knowledge repositories (e.g., Kankanhalli, Tan, & Wei, 2005). Only recently, research has started to examine the effects of *specific* technological features on building and supporting knowledge sharing communities (Kraut et al., 2012; Leonardi & Treem, 2012; Ren & Kraut, 2014; Treem & Leonardi, 2012).

In this paper, we focus on information display. More specifically, we compare a pull-design with a push-design as nowadays, when using the Internet, information can flow from source to consumer in two fundamental ways: a)

information pull, where a consumer or user takes (or is given) the initiative to get it, or b) *information push*, where a supplier takes (or is given) the initiative to deliver it (e.g., RSS feeds). When pulling information from different sources on the Internet, individuals invest more time, energy, more physical (e.g., clicking) and cognitive (e.g., judging information by relevance) effort. Once they have acquired the information, they may develop a sense of ownership for that particular information and be reluctant to share it. In contrast, push-information systems (e.g., news feeds sorted by relevance) require less from the individual in terms of effort and time investments and ownership feelings are less likely to develop. Thus, how information has been accessed and the time and effort required to get the information might influence how readily, how much and what type of information people are willing to share. In line with this reasoning, we argue that more information will be shared in a push-information display situation than in a pull-information display situation. Our hypothesis is formulated as follows:

H5: Individuals share more information in the push-information display situation than in the pull-information display situation.

Moreover, we also argue that the design moderates the effects of social motivation on SIS. In general, in the pull-information display situation, individuals have to pull the various pieces of information actively from various folders. This procedure is somewhat clumsy and requires more (cognitive) effort; people might already forget some pieces of information whilst opening the next folder. The push-design provides a clearly structured overview over the available information making it easier to make strategic decisions. Whether people indeed share more of their private information or decide to keep it for themselves, however, depends then on their social motivation. Thus, we expect:

H6: The effect of social motivation, i.e. that prosocials share a) more private and b) more important information than proselves, is more pronounced in the push-information display condition than in the pull-information display condition.

To test these hypotheses, we conducted two experiments. Experiment 1 looked at the joint effects of social motivation (prosocial vs. proself), time pressure (high vs. low) and technological features (push- vs. pull-information display) on SIS. Using a simpler experimental design, Experiment 2 aimed to replicate the findings on the technological features and focused more specifically on time pressure and the role of NFCC as potential underlying mechanism.

2.2. Experiment 1

2.2.1. Method

2.2.1.1. Participants and Design

One hundred and twenty-five university students (53 males, 72 females; mean age 22.3 years, SD = 5.22, range 17 – 65) took part in the study and received 3.5 Euros (approx. 5 US dollars) in return for their participation. The experiment had a 2 (information display: push- vs. pull-information) x 2 (social motivation: prosocial vs. proself) x 2 (time pressure: high vs. low) between subjects design; information importance (important vs. unimportant) and sharedness (public vs. private) were varied as within-subjects factors.

2.2.1.2. Procedure

Upon arrival in the laboratory, each participant was escorted to an isolated cubicle and seated in front of a computer via which (s)he received all the instructions. Participants read that the research is about creativity and the purpose is to assess the extent to which mystery solving skills can lead to the expression of creative behavior. Participants were instructed that the first part of the study was about solving a mystery of a stolen painting. Following the structure of the mystery solving task used by (e.g., Steinel et al., 2010), we developed the story of the Mona Lisa painting displayed at and subsequently stolen from The Louvre Museum in Paris. Participants read that the second part (which actually did not take place) is an interactive creativity session. Further, they were told that they are collaborating via a computer network in a three-person group. Each participant first received pieces of information about the crime. Participants were told that the received information will help them solve only part of the mystery and that the mystery may be solved completely through

the exchange of information with the other group members. Each piece of information could be shared with the other group members by pressing either a 'Share' or an 'E-mail' button. Once pressed, the participant could either see a screen with a message confirming the sharing of that piece of information (in case of pressing the 'Share' button) or a screen where the participant could write a message to the sender(s), the piece of information being already attached to that message (in case of pressing the 'E-mail' button). Subsequently, the participant was re-directed to the initial main screen with information. While sharing, the participants were informed that they will see and discuss the shared information after the sharing phase. After the information sharing task was completed, participants filled in a questionnaire containing the manipulation checks. After that, they were debriefed, thanked and paid. The experimenter, for pilot-testing reasons, asked the first five participants, at the end of their participation, whether they could easily follow the instructions and perform the task. All five participants had a similar understanding of the study and reported no structural or content-wise suggestions after completing it; the study continued therefore running in its initial form and the first five participants were added to the final student sample used for analyses.

2.2.1.3. Independent Variables

Information sharedness was manipulated by displaying information pieces under the label of either public or private information. Participants were told that their private information came from a French professional detective and that no other group member can see it; the public information was said to come from the internet and that all group members received it.

To manipulate *information importance* we first pre-tested 28 pieces of information in terms of importance: 5 independent raters were asked to go over 28 pieces of information about the mystery of the stolen Mona Lisa painting in order to find out 1) the real name of the thief and 2) the four reasons for stealing the painting. They were asked to mark each piece of information in terms of importance (i.e., considering the extent to which it was helpful or not at all helpful for finding the thief and the reasons). Out of 28 pieces of information, all 5 raters agreed on 19 pieces of information as being either important (i.e., 8

pieces) or unimportant (i.e., 11 pieces). As some pieces of information contained more words than others, we decided to split them to create additional ones: 3 more for unimportant (up to 14 pieces in total) and 2 more for important (up to 10 pieces in total; 4 new important information pieces were added (up to 14 pieces in total), making sure they contained important cues (e.g., identity, motive, arrests etc.) as the ones rated previously as important. In the actual study, all 28 pieces of information were then displayed under the label of either important (i.e., 14 task-relevant information pieces) or unimportant (i.e., 14 task-irrelevant information pieces) information; labels were visible only in the push-information display condition. One example of unimportant information is: “Everyone had been talking about the glass panes that museum officials at the Louvre had put in front of several of their most important paintings”. One example of important information is: “Soon after he placed the ad, Geri received a letter dated November 29 (1913) that stated the writer was in possession of the stolen *Mona Lisa*”. The two factors (i.e., sharedness and importance) were manipulated orthogonally resulting in a) 7 pieces public important information (i.e., 279 words), b) 7 pieces public unimportant information (i.e., 295 words), c) 7 pieces private important information (i.e., 245 words), and d) 7 pieces private unimportant information (i.e., 227 words).

Information display was manipulated by comparing two types of information display: push *versus* pull. In the *push-information* condition, all the information was displayed on one computer screen in a tailored manner. More specifically, the pieces of information labeled as important or unimportant were displayed under either public or private sections of information, respectively. In the *pull-information* condition, the important and unimportant information was stored in public and private folders; the information was not tailored (i.e., labeled as important or unimportant) anymore and participants had to pull it by clicking the folder. Also, to make it more effortful, access to private folders was delayed by shortly displaying a loading-page screen informing participants that the system enables access to the private folder.

Social motivation was manipulated by the incentive structure (Steinel et al., 2010; S. Utz & Steinel, 2008). Participants in the *prosocial motive* condition were told that, if *the group* solves the mystery, each group member will be

rewarded with 39 Euros (the price for a Paris Museum 2-day pass); participants in the *proself motive* condition were told that *the group member* who solves the mystery will be rewarded with 39 Euros.

In the *high-time pressure* condition, participants were told the group (member) has 10 minutes (pre-tests indicated that this is a good time allocation for the high-time pressure condition) to solve the mystery and a clock was displayed on the screen; it was made explicit for them that “once the time expires, an automatic window will pop up with further instructions”. Participants in the *low-time pressure* condition were told that the group (member) has as much time as it (s/he) needs to solve the mystery, no clock was displayed on the screen and there was no cut off time for performing the task. As participants did not actually receive the reward for solving the mystery, we randomly selected one winner and paid out the 39 Euros after the data collection was completed. This was announced at the end of the experiment, immediately after the participants were debriefed.

2.2.1.4. *Dependent Measures*

Sharing of information is the dependent variable² in this study. The number of shared pieces of each type of information (important-public, unimportant-public, important-private, and unimportant-private) was used for scoring the provision of information.

The manipulation check items for *social motivation* were adapted from Beersma et al. (2003). Thus, the manipulation check item for prosocial motivation was “It was important for me to solve the mystery as a group”. The manipulation check item for proself motivation was “I was competing with the others on my group in order to solve the mystery”. Answers were given on a 7-point Likert-type scale, ranging from (1) *Disagree strongly* to (7) *Agree strongly*; the two items measure two different constructs (Beersma et al., 2003) and were used separately.

² As previously mentioned, group members could press either a ‘Share’ or an ‘E-mail’ button. 83.2% of the participants never or only once used the ‘E-mail’ button while only 37.6% of the participants never or only once used the ‘Share’ button. Therefore, the sum of the information pieces shared by pressing either one or the other button was used as DV.

The manipulation check items for *time pressure* were adapted from Edland (1994): 1) “How much time pressure did you feel when reading and sharing the information?” and 2) “How fast did you need to make your decisions?”. Answers were given on a 7-point Likert-type scale, ranging from (1) *No time pressure* to (7) *Great time pressure* and from (1) *Not at all fast* to (7) *Very fast*, respectively; due to low reliability ($\alpha = .53$), items were used separately. Additionally, to account for the real time spent on the task, *actual time used* was also measured using the system variable for time available in Authorware.

No manipulation check items were used for the manipulation of the *information display* (O’Keefe, 2003). Perdue and Summers (1986) argue that when the independent variable is concrete, observable (e.g., price, color) it is relatively simple to confirm that it was manipulated as intended (O’Keefe, 2003) and that its statistical significance should not be a concern; the push- and pull-information conditions were clearly different and were used accordingly.

2.2.2. Results

2.2.2.1. Manipulation Checks

A multivariate analysis of variance with *social motivation* as the independent variable and the two manipulation check items as dependent variables showed a significant overall effect, $F(2, 122) = 127.45, p < 0.001, \eta_p^2 = 0.67$. Prosocials indicated that it was more important to solve the mystery as a group than proselves ($M = 5.14, SD = 1.69$ vs. $M = 2.58, SD = 1.29$; $F(1,123) = 90.50, p < 0.001, \eta_p^2 = 0.42$). Proselfs indicated that they were competing more with the others in the group to solve the mystery than prosocials ($M = 4.76, SD = 1.70$ vs. $M = 1.92, SD = 1.19$; $F(1,123) = 116.34, p < 0.001, \eta_p^2 = 0.49$). The social motivation manipulation was thus successful.

A multivariate analysis of variance with *time pressure* as the independent variable and the two manipulation check items as dependent variables showed a significant overall effect, $F(2, 122) = 8.77, p < 0.001, \eta_p^2 = 0.13$. Participants felt more time pressure in the high time pressure condition than participants in the low time pressure condition ($M = 4.86, SD = 1.71$ vs. $M = 3.54, SD = 1.83$; $F(1,123) = 17.35, p < 0.001, \eta_p^2 = 0.12$). Participants in the high

time pressure condition tended also to feel that they need to make their decision faster than participants in the low time pressure condition ($M = 4.27$, $SD = 1.63$ vs. $M = 3.70$, $SD = 1.64$; $F(1,123) = 3.67$, $p = 0.058$, $\eta_p^2 = 0.03$). Thus, we consider the time pressure manipulation as successful.

2.2.2.2. Descriptive Statistics and Intercorrelations

Table 1 shows the means, standard deviations and intercorrelations of the manipulated and measured variables. In line with previous research (Steinel et al., 2010), there was a strong positive correlation between social motivation and the provision of private important information; a negative correlation was found between time pressure and the provision of private important information as well as a strong negative correlation between time pressure and actual time used.

Table 1.

Means, standard deviations and intercorrelations of the dependent measures and independent variables.

	Variable	M	SD	1	2	3	4	5	6	7	8
1.	Information Display	0.50	0.50	-							
2.	Social Motivation	0.50	0.50	-0.04	-						
3.	Time Pressure	0.51	0.50	0.04	-0.01	-					
4.	Provision of Public Unimportant Information	0.64	1.64	0.05	0.07	-0.14	-				
5.	Provision of Public Important Information	1.85	2.26	0.13	0.13	-0.13	0.53**	-			
6.	Provision of Private Unimportant Information	0.87	1.83	-0.09	0.07	-0.17	0.63**	0.59**	-		
7.	Provision of Private Important Information	2.20	2.47	-0.09	0.28**	-0.24 **	0.37**	0.69**	0.40**	-	
8.	Actual time used (in seconds)	565.20	314.04	0.03	0.03	-0.34**	0.28**	0.26**	0.21*	0.21*	-

Note: Information Display is recoded from the experimental manipulation (0 = push-information display, 1 = pull-information display). Social Motivation is recoded from the experimental manipulation (0 = proself motivation, 1 = prosocial motivation). Time Pressure is recoded from the experimental manipulation (0 = low time pressure, 1 = high time pressure).

** $p < 0.01$, * $p < 0.05$

2.2.2.3. Information Sharing

Instead of performing an analysis of variance (ANOVA) which is usually the most appropriate method when the groups of observations are created by categorical independent variables (Iversen & Norpoth, 1987), to test the current hypotheses, a mixed analysis of covariance (ANCOVA) was performed: *information display* (push- vs. pull-information display), *social motivation* (prosocial vs. prosself) and time pressure (high vs. low) were used as between-subjects factors and *information importance* (important vs. unimportant) and *information sharedness* (public vs. private) were used as within-subject factors; *actual time used* was included as a covariate³. Using ANCOVA allowed us to determine the covariation between the actual time used and the sharing of information, removing the variance associated with the actual time used from the sharing of information scores, prior to determining whether the differences between the experimental condition means were significant (Rutherford, 2001).

Main effects of information importance, $F(1, 116) = 10.79, p < 0.01, \eta_p^2 = 0.09$, and information sharedness, $F(1, 116) = 6.83, p < 0.05, \eta_p^2 = 0.06$, showed that more important ($M = 4.05, SD = 4.35$) than unimportant ($M = 1.51, SD = 3.13$) and more private ($M = 3.07, SD = 3.62$) than public ($M = 2.49, SD = 3.43$) information was revealed. In line with H1, a significant main effect of social motivation, $F(1, 116) = 4.25, p < 0.05, \eta_p^2 = 0.04$ showed that prosocials shared more information than proselves ($M = 6.76, SD = 6.90$ vs. $M = 4.34, SD = 6.19$). In line with what was predicted in H2a, the significant two-way interaction between information sharedness and social motivation, $F(1, 116) = 4.06, p < 0.05, \eta_p^2 = 0.03$, indicated that prosocials shared significantly more private information than proselves ($M = 3.87, SD = 3.88$ vs. $M = 2.26, SD = 3.16, t[123] = -2.55, p < 0.05$). No significant difference was found between prosocials and proselves with regard to the public information ($M = 2.89, SD = 3.56$ vs. $M = 2.08, SD = 3.27, t[123] = -1.32, p = 0.19, ns$). Furthermore and in line with H2b,

³ We controlled for the actual time used since more information can be shared when there are no time constraints. An exploratory test, $F(1, 117) = 15.86, p < 0.001$, showed that participants under high (vs. low) time pressure took less time to complete the task ($M = 460.82, SD = 182.74$ vs. $M = 674.71, SD = 380.71$). Moreover, participants under low time pressure took on average somewhat more than 10 minutes (600 seconds) confirming that the time limit of 10 minutes indeed imposed some pressure without making the task unsolvable.

a two-way significant interaction between information importance and social motivation, $F(1, 116) = 5.19, p < 0.05, \eta_p^2 = 0.04$, indicated that prosocials shared significantly more important information than proselves ($M = 5.02, SD = 4.54$ vs. $M = 3.06, SD = 3.94, t[123] = -2.57, p < 0.05$), but did not differ from proselves in sharing unimportant information ($M = 1.75, SD = 3.07$ vs. $M = 1.27, SD = 3.19, t[123] = -0.84, p = 0.40, ns$).

In contrast to $H3$, the main effect of time pressure was not significant, $F(1, 116) = 2.17, p = 0.14, \eta_p^2 = 0.02^4$. However, and even more interesting, we found a significant two-way interaction between information sharedness and time pressure, $F(1, 116) = 5.06, p < 0.05, \eta_p^2 = 0.04$. People under low time pressure shared significantly more private information than people under high time pressure ($M = 4.00, SD = 4.10$ vs. $M = 2.19, SD = 2.85, t[123] = 2.86, p < 0.01$); no significant differences were found with regard to public information ($M = 3.02, SD = 4.12$ vs. $M = 1.98, SD = 2.54, t[123] = 1.68, p = 0.10$ and the interaction between time pressure and information importance, $F(1, 116) = 0.79, p = 0.38, \eta_p^2 = 0.01, ns$.

Actual time used yielded a significant main effect, $F(1, 116) = 6.59, p < 0.05, \eta_p^2 = 0.05$. Not surprisingly, as can be seen in Table 1, the more time people spent on the task the more information they shared. However, there was no support for $H4a-b$, as there was no significant three-way interaction between social motivation, time pressure, and information importance, $F(1, 116) = 0.04, p = 0.85, \eta_p^2 = 0.00, ns$, or information sharedness, $F(1, 116) = 0.42, p = 0.52, \eta_p^2 = 0.00, ns$, respectively.

⁴ In the absence of the covariate, the ANOVA showed a significant effect of time pressure, $F(1, 117) = 6.03, p < 0.05, \eta_p^2 = 0.05$. Overall, the other effects remained unchanged, i.e., a significant main effect of information importance, $F(1, 117) = 60.38, p < 0.001, \eta_p^2 = 0.34$, of information sharedness, $F(1, 117) = 8.51, p < 0.01, \eta_p^2 = 0.07$, of social motivation, $F(1, 117) = 4.41, p < 0.05, \eta_p^2 = 0.04$; a significant interaction effect of information importance and social motivation, $F(1, 117) = 5.29, p < 0.05, \eta_p^2 = 0.04$, of information sharedness and information display, $F(1, 117) = 14.24, p < 0.001, \eta_p^2 = 0.11$. In the absence of the covariate, we also found a significant three way interaction between information sharedness, social motivation and information display, $F(1, 117) = 8.94, p < 0.01, \eta_p^2 = 0.07$, indicating that prosocials shared more private information than proselves ($M = 4.48, SD = 3.79$ vs. $M = 2.30, SD = 3.47, t[61] = -2.38, p < 0.05$) in the push-information condition, but not in the pull-information condition ($M = 3.20, SD = 3.93$ vs. $M = 2.22, SD = 2.90, t[60] = -1.12, p = 0.27, ns$). No significant difference was found between prosocials and proselves for public information neither in the push ($M = 2.24, SD = 3.16$ vs. $M = 1.97, SD = 3.55, t[61] = -0.33, p = 0.75, ns$) nor in the pull-information condition ($M = 3.60, SD = 3.88$ vs. $M = 2.19, SD = 3.03, t[60] = -1.60, p = 0.11, ns$).

Although the main effect of information display was not significant, $F(1, 116) = 0.00$, $p = 0.97$, $\eta_p^2 = 0.00$, *ns*, providing no support for *H4*, we found a significant two-way interaction between information sharedness and information display, $F(1, 116) = 13.80$, $p < 0.001$, $\eta_p^2 = 0.11$: more private than public information was shared in the push-information condition ($M = 3.44$, $SD = 3.78$ vs. $M = 2.11$, $SD = 3.33$, $t[62] = -4.42$, $p < 0.001$); no significant difference was found in the pull-information condition ($M = 2.69$, $SD = 3.44$ vs. $M = 2.87$, $SD = 3.51$, $t[61] = 0.68$, $p = 0.50$, *ns*).

In line with *H6a*, the three-way significant interaction (Figure 1) between information sharedness, social motivation and information display, $F(1, 116) = 9.21$, $p < 0.01$, $\eta_p^2 = 0.07$, indicated that prosocials shared more private information than proselves ($M = 4.48$, $SD = 3.79$ vs. $M = 2.30$, $SD = 3.47$, $t[61] = -2.38$, $p < 0.05$) in the push-information condition, but not in the pull-information condition ($M = 3.20$, $SD = 3.93$ vs. $M = 2.22$, $SD = 2.90$, $t[60] = -1.12$, $p = 0.27$, *ns*). No significant difference was found between prosocials and proselves for public information neither in the push ($M = 2.24$, $SD = 3.16$ vs. $M = 1.97$, $SD = 3.55$, $t[61] = -0.33$, $p = 0.75$, *ns*) nor in the pull-information condition ($M = 3.60$, $SD = 3.88$ vs. $M = 2.19$ vs. 3.03 , $t[60] = -1.60$, $p = 0.11$, *ns*). *H6b* was not supported, $F(1, 116) = 0.13$, $p = 0.73$, $\eta_p^2 = 0.00$, *ns*. Also, as can be seen in Figure 1 (i.e., the first two black bars), only prosocials in the push-information display condition shared significantly more private than public information ($M = 4.48$, $SD = 3.79$ vs. $M = 2.24$, $SD = 3.16$, $t[32] = -4.94$, $p < 0.00$). All other main and interaction effects were non-significant, F 's < 0.12 , p 's $> .73$, η_p^2 's $< .00$.

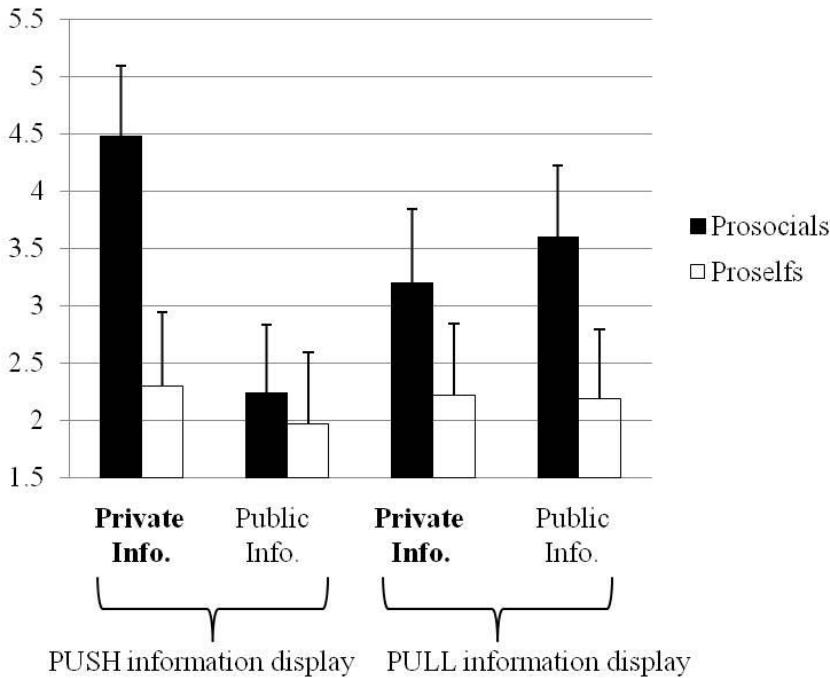


Figure 1. The mean number of the public and private pieces of information shared as a function of technological feature (push vs. pull information display) and prosocialness (prosocial vs. proself motivation)

2.2.3. Discussion

In this experiment, we conceptually replicated and extended the findings of Steinel et al. (2010) in a more complex setting using actual and a bigger amount of pieces of information (i.e., individuals received 28 instead of 12 pieces of information). We found that social motivation influenced information pooling such that individuals with a prosocial motivation shared more important information than individuals with a proself motivation. At the same time, individuals with a prosocial motivation shared significantly more private information than individuals with a proself motivation; overall, prosocials shared more information than proselfs.

More important, the results showed that information display influences strategic information sharing. The main effect of information display was not significant; instead, an even more interesting two-way interaction between

information display and sharedness of information emerged. In the push-information display condition, significantly more private than public information was shared. However, this effect was found for prosocials only. In other words, the push-information display brought out the best in prosocials without worsening the behavior of proselfs. Prosocials acted towards their motivational drivers as they did not have to spend time ‘sorting’ the information out of the amount of mixed (i.e., important and unimportant) information. In the pull-information display condition, respondents had to judge the importance of the information by themselves as it is usually the case in pull-information systems (Pedley, 1999). It is interesting to note that the overall amount of information shared by proselfs was low and that information displays did not play a role. In other words, proselfs seem to be ‘immune’ and do not act upon the new technological advancements that facilitate the access to more relevant information. Nevertheless, the interaction of design with sharedness of information is very encouraging because it demonstrates that a technological invention can stimulate mainly the sharing of private information – the information that is often much needed to find the best solution. We aim to replicate this interaction between display and sharedness of information (H7) in Experiment 2.

For time pressure, we also did not find a simple main effect, but an interaction with sharedness of information: time pressure mainly affected the sharing of private information; time pressure also correlated negatively with the provision of private important information (Table 1). The actual time used correlated positively with all four types of information. These results point out that time pressure might have even more detrimental effects on information sharing than often assumed. It does not simply lead to lower overall levels of sharing, but hinders especially the sharing of private information that is much needed for optimal decision making.

A more psychological explanation for this effect of time pressure is the increased NFCC in the high time pressure condition. People high in NFCC want to reach quick decisions and are aversive of ambiguity and uncertainty; consequently, they share less information because more information might increase ambiguity and prolong the decision making process. People low in

NFCC are more tolerant towards ambiguity and uncertainty; they might therefore share the private information even if it challenges the seemingly obvious solution and increases therefore ambiguity. Time pressure has often been used to experimentally manipulate NFCC (Bechtoldt, De Dreu, Nijstad, & Choi, 2010; Chirumbolo, Livi, Mannetti, Pierro, & Kruglanski, 2004; De Dreu, Nijstad, Bechtoldt, & Baas, 2011; Pierro, Kruglanski, & Raven, 2012). However, in the present study we are not able to say whether the effects of time pressure are driven by actual time pressure or indeed by the higher NFCC in the high time pressure condition because the high time pressure groups had less time and time also affected information sharing. Thus, to be able to disentangle the two explanations, in Experiment 2 we avoid this confound by giving both groups the same amount of time, but framing this amount either as ample time or as too little time (De Dreu, 2003). Another limitation is that this study used a mystery story. Even people in the proself condition might have been motivated to find the thief (see Steinel et al. (2010) for higher information sharing rates in a murder mystery). In Experiment 2 we use a different cover story involving a truly mixed-motive situation: people who need help in applying for a scholarship, but compete at the same time with other applicants. To reduce the complexity of the design and because the effect of social motivation on information sharing has been demonstrated repeatedly (Steinel et al., 2010; Toma & Butera, 2009), we drop social motivation from the second experiment.

2.3. Experiment 2

2.3.1. Method

2.3.1.1. Participants and Design

Seventy-one university students (25 males, 46 females; mean age 19.6 years, SD = 2.10, range 17 – 26) took part in the study and received 3.5 Euros (approx. 5 US dollars) in return for their participation. The experiment had a 2 (information display: push- vs. pull-information display) x 2 (perceived time pressure: high vs. low) design; information importance (important vs. unimportant) and sharedness (public vs. private) were varied as within-subjects factors.

2.3.1.2. Procedure

As in Experiment 1, upon arrival in the laboratory, each participant was escorted to an isolated cubicle and seated in front of a computer via which (s)he received all the instructions. Participants read that the research is about how people prepare for an application and how they process information. In particular, they were told to imagine studying a semester abroad, that Victoria University, Melbourne from Australia, was their study destination and that they were connected via the computer with two other students, also interested in studying at the same university. Task instructions were formulated in a way to create a mixed-motive situation. To induce a cooperative motivation, each participant was also told to imagine that the other two students were fellow students from the same semester and that they all study and work together on various assignments. In order to prepare, they communicate via the computer, collaborate and help each other to increase each other's chances of having a successful application. To induce, at the same time, a competitive motivation, participants were told that they will be required to send individual applications that should reflect a good quality because, due to their popularity, Australian universities usually receive more applications than places available.

The study was presented as structured in two phases. In the first phase, participants were provided with pieces of information meant to help them prepare a successful study-abroad application. For each piece of information, participants could press a 'Share' button to share information with the others; after the message confirming the sharing, the participant was re-directed to the initial main screen with information. Participants were told that they would see the information everyone shared and will then discuss about an optimal strategy for the scholarship application in the second phase (which actually did not take place). After the information sharing task was completed, participants filled in a questionnaire containing the manipulation checks. After that, they were debriefed, thanked and paid. Similar with Experiment 1, the experimenter, for pilot-testing reasons, asked the first five participants, at the end of their participation, whether they could easily follow the instructions and perform the task. All five participants had a similar understanding of the study and reported no structural or content-wise suggestions after completing it; the study

continued running in its initial form and the first five participants were added to the final student sample used for analyses.

2.3.1.3. *Independent Variables*

Information sharedness was manipulated as in Experiment 1. The participants were told that the public information was accessible to all three group members and, this time, that it was collected from the Australian University website and that it was about the requirements and application procedure (e.g., deadlines, documents needed). The private information was accessible to them only and the participants were told to consider that they gathered this information themselves by talking with other people on Facebook, with friends who had similar experiences, and even with one professor; they all provided information (e.g., tips and suggestions) about the scholarship application.

Information importance was manipulated as in Experiment 1 but was not signaled by labels anymore. As in Experiment 1, a total of 28 pieces of information were used; they were no longer pre-tested in terms of importance as the distribution clearly distinguished between important and unimportant ones: the unimportant information was not related to the application process itself as it referred to Melbourne as a city, its inhabitants, the economy, social life, courses' evaluation etc. On the other hand, the important information referred to application forms, deadlines, fees, language test requirements for application, details that the motivation letter or the Curriculum Vitae should contain etc. One example of unimportant information is: "Melbourne is the second most populous city in Australia. Based in Melbourne, Victoria University is a public university and one of the best education systems in the world". One example of important information is: "Don't forget to add your hobbies in your CV. The most important thing is not to list them only. Give few details on how frequent you enjoy your hobbies and how did you discover them. Don't make it too long but this information should be in there". Similar to Experiment 1, two factors (i.e., sharedness and importance) were manipulated orthogonally resulting in a) 7 pieces public important information (i.e., 318 words), b) 7 pieces public unimportant information (i.e., 285 words), c) 7 pieces private important

information (i.e., 324 words), and d) 7 pieces private unimportant information (i.e., 279 words).

Information display was manipulated as in Experiment 1. We used a different *time pressure* manipulation. Following De Dreu (2003)'s approach, we specifically told participants in both time pressure conditions that they have 10 minutes to complete the task: 1) in the high time pressure condition participants were told that 10 minutes are often quite tight to spend on the screen with information whereas 2) in the low time pressure condition participants were told that 10 minutes are more than enough to spend on the screen with information. In both conditions, they were also told that a clock displayed on the screen will keep track of time and that once the allotted time expires, an automatic window will pop up with further instructions.

2.3.1.4. *Dependent Measures*

Sharing of information was scored as in Experiment 1. Also as in Experiment 1, no manipulation check items were used for the manipulation of the *information display* (O'Keefe, 2003) and the push- and pull-information conditions were used accordingly. Three manipulation check items for perceived time pressure were adapted from (De Dreu, 2003) (e.g., "Did you feel you had sufficient time to read and share the information?"). Answers are given on a 7-point Likert-type scale, ranging from (1) *Not at all* to (7) *Very much*; an index ($\alpha = .74$) for perceived time pressure manipulation check was created. As in Experiment 1, *actual time* spent on the task was measured.

2.3.2. **Results**

2.3.2.1. *Manipulation Checks*

A univariate analysis of variance with perceived time pressure as the independent variable and the index for perceived time pressure manipulation check as dependent variable showed a significant overall effect, $F(1, 69) = 5.79$, $p = 0.02$, $\eta_p^2 = 0.08$, indicating that participants in the high time pressure condition felt that they had less sufficient time to read and share the information/felt under time pressure while reading and sharing the information than the participants in the low time pressure condition ($M = 3.48$, $SD = 1.22$ vs.

$M = 2.74$, $SD = 1.36$). We thus considered the manipulation of perceived time pressure as successful.

2.3.2.2. Descriptive Statistics and Intercorrelations

Table 2 shows the means, standard deviations and intercorrelations of the manipulated and measured variables. The main finding was a negative correlation between information display and the provision of private important information, indicating that less private information was shared in the pull-information display condition than in the push-information display condition.

Table 2.

Means, standard deviations, and intercorrelations of the dependent measures and independent variables.

	Variable	M	SD	1	2	3	4	5	6	7
1.	Information Display	0.48	0.50	-						
2.	Perceived Time Pressure	0.51	0.50	0.04	-					
3.	Provision of Public Unimportant Information	2.08	1.66	0.09	-0.17	-				
4.	Provision of Public Important Information	2.96	2.29	0.02	0.08	0.31**	-			
5.	Provision of Private Unimportant Information	2.59	1.62	-0.14	-0.04	0.53**	0.45**	-		
6.	Provision of Private Important Information	3.17	2.06	-0.26*	0.04	0.18	0.51**	0.45**	-	
7.	Actual time used (in seconds)	425.33	139.29	0.01	-0.02	-0.11	0.05	-0.06	0.18	-

Note: Information Display is recoded from the experimental manipulation (0 = push-information display, 1 = pull-information display). Perceived Time Pressure is recoded from the experimental manipulation (0 = low time pressure, 1 = high time pressure).

** $p < 0.01$, * $p < 0.05$

2.3.2.3. Information Sharing

Preliminary analysis indicated that conditions did not differ with regard to the actual time people spent on the task, $F(1, 66) = 0.07$, $p = 0.79$, $\eta_p^2 = 0.00$, and that time also did not correlate with information sharing; the actual time variable was therefore left out from further analyses. A mixed ANOVA was performed, with *information display* (push- vs. pull-information display) and *perceived time pressure* (high vs. low) as between-subjects factors and *information importance* (important vs. unimportant) and *information sharedness* (public vs. private) as within-subject factors.

Main effects of information importance, $F(1, 67) = 11.51$, $p < 0.01$, $\eta_p^2 = 0.15$, and sharedness, $F(1, 67) = 4.54$, $p < 0.05$, $\eta_p^2 = 0.06$, showed that more important ($M = 6.13$, $SD = 3.78$) than unimportant ($M = 4.68$, $SD = 2.87$) and more private ($M = 5.76$, $SD = 3.13$) than public ($M = 5.04$, $SD = 3.21$) information was revealed. The main effect of perceived time pressure was not significant $F(1, 67) = 0.01$, $p = 0.93$, $\eta_p^2 = 0.00$; none of the interaction effects involving time pressure was significant, all F s < 2.19 , *ns*.

We replicated the two-way interaction between information sharedness and information display, $F(1, 67) = 8.65$, $p < 0.01$, $\eta_p^2 = 0.11$. Again, in line with H7, significantly more private than public information was shared in the push-information condition ($M = 6.49$, $SD = 3.19$ vs. $M = 4.86$, $SD = 3.13$, $t[36] = -3.13$, $p < 0.01$). Also, as shown in Figure 2, significantly more private information was shared in the push-information display condition than in the pull-information-display condition $t[69] = 2.09$, $p < 0.05$). All other main and interaction effects were non-significant, F 's < 0.68 , p 's $> .41$, η_p^2 's $< .01$.

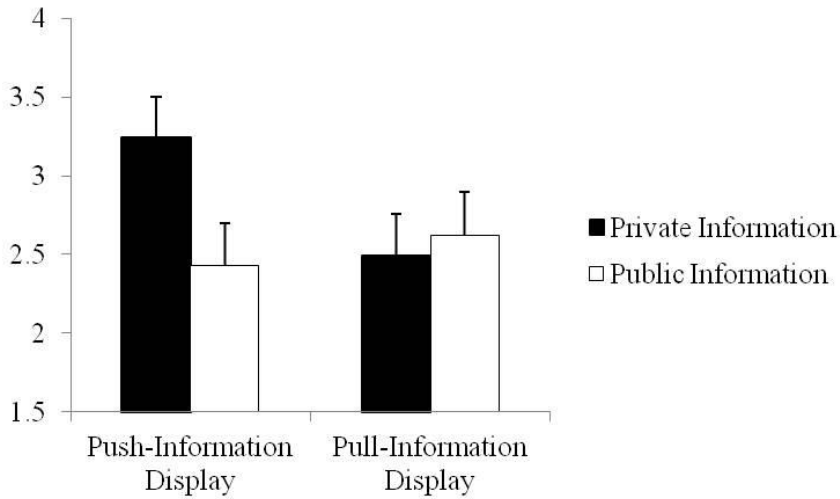


Figure 2. The mean number of the public and private pieces of information shared as a function of technological feature (push vs. pull information display)

2.3.3. Discussion

Experiment 2 replicated the significant interaction found in Experiment 1, between information display and sharedness: the findings indicated that the push-design mainly increased the sharing of private information (i.e., H7 supported). Moreover, this significant interaction has been found while using a mixed-motive scenario that, differently from Experiment 1, did not contain a strong moral component (i.e., finding the thief) and therefore extended the findings' applicability to more real (i.e., educational) settings.

With regard to the overall type of information shared and in line with what we found in Experiment 1, main effects of information importance and sharedness showed that, in general, more important and more private information was revealed. These results are in line with prior studies (Bowman & Wittenbaum, 2012; Steinel et al., 2010) also challenging the generalizability of the information sampling bias (Stasser & Titus, 1985; Stasser et al., 2000).

The predicted main effect of *perceived* time pressure was not significant and *perceived* time pressure did also not interact with information sharedness. These results indicate that it is *actual* time pressure rather than *perceived* time pressure that drives the effects. Nevertheless, by showing that it is not NFCC that

drives the effects of actual time pressure, this second experiment contributes to the deeper understanding of the underlying processes, inspiring further theoretical development (Reis & Judd, 2014).

2.4. General Discussion

In two experiments, we examined the separate and joint impact of social motivation, perceived (vs. actual) time pressure and technological features on SIS. Our main finding is that technological features (i.e., information display) can stimulate the sharing of private information and that this applies especially to individuals who are prosocially motivated. Our findings demonstrate once more that information pooling is a motivated process and that social motivation plays an important role in information sharing. The findings with regard to time pressure indicate that actual time pressure and not perceived time pressure impact the sharing of information; in other words, no convincing support is found for a possible impact of induced NFCC on SIS (Table 3 below provides a summary of the hypothesis-testing results). Our paper contributes to the field of information systems and human-computer interaction research in two fundamental ways. First, by simultaneously investigating the impact of social motivation and time pressure on SIS we shed light on the processes underlying the strategic sharing or withholding of information. Second, by examining the role of technological features, in particular the display of information, we demonstrate how information systems design can increase the sharing of private information. Overall, this paper innovatively bridges social psychology and information systems literature to examine how psychological and technological variables affect SIS.

Table 3.
Hypothesis-testing results

No.	Hypothesis	Results	
		Study 1	Study 2
H1.	Prosocials share more information than proselves.	Supported	Not tested
H2.	Prosocials share more a) private and b) important information than proselves.	Supported	Not tested
H3.	People under high time pressure share less information than people under low time pressure.	Not Supported*	Not Supported
H4.	The effect of social motivation, i.e. that prosocials share a) more private and b) more important information than proselves, is more pronounced under low time pressure than under high time pressure.	Not Supported	Not tested
H5.	Individuals share more information in the push-information display situation than in the pull-information display situation.	Not Supported	Not Supported
H6.	The effect of social motivation, i.e. that prosocials share a) more private and b) more important information than proselves, is more pronounced in the push-information display condition than in the pull-information display condition.	H6a Supported	Not Tested
		H6b Not supported	
H7.	More private than public information is shared in the push-information display condition than in the pull-information display condition.	Supported	Supported

* The non-hypothesized interesting results were: people under low time pressure shared significantly more private information than people under high time pressure; no significant differences were found with regard to public information.

2.4.1. Theoretical and Practical Implications

From a theoretical perspective, firstly, we advance research in the field of information systems by investigating how specific technological features (i.e., information display) impact SIS in the light of social motivation and time pressure. This novel research angle helped us to detect a complex interplay between information display, information sharedness, and social motivation. Prosocials (vs. proselves) shared more private than public information in the push- but not in the pull-information display condition, indicating that information display can affect information sharing behavior of individuals with different social value orientations. Experiment 2 replicated one of the most important findings: the push-design mainly affects the sharing of private

information. People might feel less ownership for private information if they receive it without much effort as is the case with the push display. Secondly, our findings replicate and extend prior research on SIS (Steinel et al., 2010) by using more complex (i.e., with more and actual information) and thus also more realistic settings, showing once again, that information sharing is strategic behavior influenced by social motive. Thirdly, we advance research on the role of time pressure in information sharing by disentangling the effects of actual and perceived time pressure. We demonstrated that actual time pressure is detrimental because it mainly affects the sharing of private information. We further showed that these effects are not driven by NFCC that should have been increased given the perceived time pressure; this manipulation has been used successfully in prior research (Bechtoldt et al., 2010; Chirumbolo et al., 2004; De Dreu et al., 2011; Pierro et al., 2012). Future research should look at other factors that might be induced by time pressure, such as attentional focus, selectivity, or stress (Kelly & Karau, 1999; Maule & Edland, 1997).

From a practical perspective, our findings are timely and relevant because we retrieve more and more information via feeds, be it via RSS or Twitter. These feeds present people with large amounts of information even for one specific topic. An understanding of the processes by which technological features influence information sharing provides valuable advice for the technological design of online collaborative platforms. These particular findings may inform by and large the development of technology strategies by matching technological forecasting techniques to technologies in organizations (e.g., Mishra, Deshmukh, & Vrat, 2002) while considering the human aspects associated with the technology as well. Specifically, designing push-information sharing platforms is encouraged because it seems to be motivating for prosocials who, given the advantages such a technology affords, reveal more unshared information. Although it did not increase information sharing of proselfs, it also did not decrease it; we thus recommend the use of push-information sharing platforms.

The results also inspire managers of online collaborative platforms. Proselfs were unaffected by the display in Experiment 1, but note that we manipulated prosocial and proself orientation simply by varying the bonus

structure. To stimulate the sharing of the unique information, managers should stress the cooperative aspects of the task and reduce selfish motives for instance by rewarding team performance, inducing a cooperative norm (Steinel et al., 2010), or increasing the level of social identification (De Cremer & Van Vugt, 1999). These specific recommendations are also in line with the findings from previous research: a lack of competition among individuals in online communities of practice (e.g., nurses, web developers, literacy educators) is one motivator for members to share knowledge (Hew, 2009).

Because time constraints seem to impact the sharing of (private) information for prosocials, online platform designers should try to 1) avoid time pressure or 2) at least make deadlines less salient in accomplishing task responsibilities. A third option would be to increase visibility of those individuals who are able to cope with work requirements under time pressure.

2.4.2. Limitations and Strengths

First, we acknowledge that using a student sample may limit the generalisability of the findings to other (professional) populations. However, we are mainly interested in the effects of the three factors and therefore *manipulated*, via experiments, social motivation, time pressure and information display. Thus, we are confident that the main findings would hold in an organizational setting of professionals too. Second, one might argue that students, as frequent users of social media, are more familiar with sharing information. However, this should mainly affect the amount of information shared by other populations, but not the pattern; at the same time, professionals in organizations, inevitably, are already users of social media. Third, participants in both studies did not actually interact with other participants and this may pose a threat to the external validity of this research. However, participants were told that the interaction will take place after the information sharing task, so this factor should not influence the results. Fourth, the sample sizes were small (i.e., $N = 125$ and $N = 71$, for Study 1 and Study 2, respectively). We acknowledge that we used the rule of thumb striving to have a minimum of 15-20 participants in each experimental condition, data collection taking place in the year 2012. The small sample sizes mean that the *between effects* suffer from low power (a power of .80 is

considered to be acceptable). However, our central findings refer to *between-within interaction effects* and studies reach high power. For a clear overview, using the software G*Power (GPOWER; Erdfelder, Faul, & Buchner, 1996), with $\alpha = .05$ and assuming an effect size of .25 and a correlation of .50 among the repeated measures (correcting also for nonsphericity, i.e., when variances of the repeated measures and all correlations between pairs of repeated measures are unequal), informed also by the results reported in the article of Steinel et al. (2010), we conducted post-hoc power analyses (i.e., the probability of finding a significant effect given specific sample and effect sizes) and found a power of .70 in Study 1 and a power of .57 in Study 2, for the *between effects*. For the *within* and the *within-between effects*, post-hoc power analyses indicated powerful studies, i.e., 1.00 or .99, respectively. However, in line with the progressive insights on statistical power in the field (Bakker, van Dijk, & Wicherts, 2012), future studies should seek to replicate our findings using bigger sample sizes.

An important strength of our research is the experimental approach used in the two studies as most related research is predominantly survey-based or qualitatively-oriented (Witherspoon, Bergner, Cockrell, & Stone, 2013). The latter methodological approaches make it difficult to detect causal relationships, especially when it comes to such a sensitive topic as withholding important private information; we used the information pooling paradigm (Steinel et al., 2010) to strengthen that information sharing is strategic behavior.

2.4.3. Future Research Directions and Conclusions

Follow-up studies should shed more light on the underlying processes of SIS. We assumed, but did not explicitly test, that the push-design affects the sense of information ownership. When people put more effort in acquiring information, they might be more reluctant to give it away. Future studies should explicitly test this explanation. Additionally, future research could explore other underlying processes which tackle the differences between push- and pull-information displays. Empirical studies should tap into current findings to assess whether effort in accessing information is more associated with pull- than with push-information displays.

The effect of time pressure on SIS seems not to be driven by NFCC;

other NFCC manipulations (e.g., via process accountability, environmental noise) could be used to substantiate this finding. More important, future research could test the role of other potential mediators of the time pressure effect such as attentional focus or selectivity. Furthermore, current research could be extended by also considering power aspects and investigating, in addition, how employees behave according to their position. One reason is because power is part of the MIP-G model and that proselves, for instance, value power (De Dreu et al., 2008) but also because knowledge is oftentimes perceived as power and, naturally, power relationships exist and develop in various online and offline work settings. Research could also look at how various ways of information display and time pressure impact information sharing between leaders and followers or to investigate SIS for people who are either prosocial or proself motivated and, at the same time, have a powerful (vs. powerless) position. Another extension would be to look at possible downsides of push information such as information overload. People might also withhold information because they do not want to overwhelm other people with clutter. Current research looked at the role of motivation and opportunity thus covering only two components of the motivation-opportunity-ability (MOA) theoretical framework (Kettinger et al., 2015; Siemsen, Roth, & Balasubramanian, 2008) that has been adopted in knowledge sharing research to better understand knowledge sharing. Since the MOA framework suggests to also consider individual's ability (Siemsen et al., 2008) to share information, future research should include this third component as well (Kettinger et al., 2015). To conclude, these are the first studies that clearly demonstrated how social motivation and time pressure impact strategic information sharing and how technology can increase the sharing of private information, in the light of these psychological factors. These first promising results open up many interesting avenues for future research.

References

- Akhavan, P., Jafari, M., & Fathian, M. (2005). Exploring Failure-Factors of Implementing Knowledge Management Systems in Organizations *Journal of Knowledge Management Practice*, 6 (May), 1-8.

- Bakker, M., van Dijk, A., & Wicherts, J. M. (2012). The Rules of the Game Called Psychological Science. *Perspectives on Psychological Science*, 7(6), 543-554. doi:10.1177/1745691612459060
- Bechtoldt, M. N., De Dreu, C. K. W., Nijstad, B. A., & Choi, H.-S. (2010). Motivated Information Processing, Social Tuning, and Group Creativity. *Journal of Personality and Social Psychology*, 99(4), 622-637. doi:10.1037/a0019386
- Beersma, B., Hollenbeck, J. R., Humphry, S. E., Moon, H., Conlon, D. E., & Ilgen, D. R. (2003). Cooperation, competition, and team performance: Towards a contingency approach. *Australian Journal of Psychology*, 55, 115-115.
- Bordia, P., Irmer, B. E., & Abusah, D. (2006). Differences in sharing knowledge interpersonally and via databases: The role of evaluation apprehension and perceived benefits. *European Journal of Work and Organizational Psychology*, 15(3), 262-280. doi:10.1080/13594320500417784
- Bowman, J. M., & Wittenbaum, G. M. (2012). Time Pressure Affects Process and Performance in Hidden-Profile Groups. *Small Group Research*, 43(3), 295-314. doi:10.1177/1046496412440055
- Brodbeck, F. C., Kerschreiter, R., Mojzisch, A., & Schulz-Hardt, S. (2007). Group decision making under conditions of distributed knowledge: The information asymmetries model. *Academy of Management Review*, 32(2), 459-479.
- Cabrera, A., Collins, W. C., & Salgado, J. F. (2006). Determinants of individual engagement in knowledge sharing. *International Journal of Human Resource Management*, 17(2), 245-264. doi:10.1080/09585190500404614
- Chen, C. T., & Tai, W. S. (2003). An information push-delivery system design for personal information service on the Internet. *Information Processing & Management*, 39(6), 873-888. doi:10.1016/s0306-4573(02)00045-6
- Chirumbolo, A., Livi, S., Mannetti, L., Pierro, A., & Kruglanski, A. W. (2004). Effects of need for closure on creativity in small group interactions. *European Journal of Personality*, 18(4), 265-278. doi:10.1002/per.518

- Chong, D. S. F., Van Eerde, W., Rutte, C. G., & Chai, K. H. (2012). Bringing Employees Closer: The Effect of Proximity on Communication When Teams Function under Time Pressure. *Journal of Product Innovation Management*, 29(2), 205-215. doi:10.1111/j.1540-5885.2011.00890.x
- Davenport, T. H., & Prusak, L. (1998). Working knowledge: How organizations manage what they know. *Boston, MA: Harvard Business School Press*.
- De Cremer, D., & Van Vugt, M. (1999). Social identification effects in social dilemmas: a transformation of motives. *European Journal of Social Psychology*, 29(7), 871-893. doi:10.1002/(sici)1099-0992(199911)29:7<871::aid-ejsp962>3.0.co;2-i
- De Dreu, C. K. W. (2003). Time pressure and closing of the mind in negotiation. *Organizational Behavior and Human Decision Processes*, 91(2), 280-295. doi:10.1016/s0749-5978(03)00022-0
- De Dreu, C. K. W., Nijstad, B. A., Bechtoldt, M. N., & Baas, M. (2011). Group Creativity and Innovation: A Motivated Information Processing Perspective. *Psychology of Aesthetics Creativity and the Arts*, 5(1), 81-89. doi:10.1037/a0017986
- De Dreu, C. K. W., Nijstad, B. A., & Van Knippenberg, D. (2008). Motivated information processing in group judgment and decision making. *Personality and Social Psychology Review*, 12(1), 22-49. doi:10.1177/1088868307304092
- Edland, A. (1994). Time Pressure and the Application of Decision Rules - Choices and Judgements among multiattribute alternatives *Scandinavian Journal of Psychology*, 35(3), 281-291. doi:10.1111/j.1467-9450.1994.tb00952.x
- Erdfelder, E., Faul, F., & Buchner, A. (1996). GPOWER: A general power analysis program. *Behavior Research Methods Instruments & Computers*, 28(1), 1-11. doi:10.3758/bf03203630
- Grant, R. M. (1996). Toward a knowledge-based theory of the firm. *Strategic Management Journal*, 17, 109-122.

- Hahn, M., Lawson, R., & Lee, Y. G. (1992). The effects of time pressure and information load on decision quality. . *Psychology and Marketing*, 9(5), 365.
- Hew, K. F. (2009). Determinants of success for online communities: an analysis of three communities in terms of members' perceived professional development. *Behaviour & Information Technology*, 28(5), 433-445. doi:10.1080/01449290802005995
- Hsu, C.-L., & Lin, J. C.-C. (2008). Acceptance of blog usage: The roles of technology acceptance, social influence and knowledge sharing motivation. *Information & Management*, 45(1), 65-74. doi:10.1016/j.im.2007.11.001
- Iversen, G. R., & Norpoth, H. (1987). Analysis of Variance. *SAGE Publications, Inc., California*.
- Jarvenpaa, S. L., Knoll, K., & Leidner, D. E. (1998). Is Anybody Out There? *Journal of Management Information Systems*, 14(4), 29-64.
- Jarvenpaa, S. L., & Leidner, D. E. (1999). Communication and trust in global virtual teams. *Organization Science*, 10(6), 791-815. doi:10.1287/orsc.10.6.791
- Kankanhalli, A., Tan, B. C. Y., & Wei, K. K. (2005). Contributing knowledge to electronic knowledge repositories: An empirical investigation. *Mis Quarterly*, 29(1), 113-14.
- Kelly, J. R., & Karau, S. J. (1999). Group decision making: The effects of initial preferences and time pressure. *Personality and Social Psychology Bulletin*, 25(11), 1342-1354. doi:10.1177/0146167299259002
- Kettinger, W. J., Li, Y., Davis, J. M., & Kettinger, L. (2015). The roles of psychological climate, information management capabilities, and IT support on knowledge-sharing: an MOA perspective. *European Journal of Information Systems*, 24(1), 59-75. doi:10.1057/ejis.2013.25
- Ko, D. G., Kirsch, L. J., & King, W. R. (2005). Antecedents of knowledge transfer from consultants to clients in enterprise system implementations. *Mis Quarterly*, 29(1), 59-85.

- Kraut, R. E., Resnick, P., Kiesler, S., Burke, M., Chen, Y., Kittur, N., . . . Riedl, J. (2012). Building Successful Online Communities: Evidence-Based Social Design. *Massachusetts Institute of Technology*.
- Leonardi, P. M., & Treem, J. W. (2012). Knowledge management technology as a stage for strategic self-presentation: Implications for knowledge sharing in organizations. *Information and Organization*, 22(1), 37-59. doi:10.1016/j.infoandorg.2011.10.00
- Li, W. (2010). Virtual knowledge sharing in a cross-cultural context. *Journal of Knowledge Management*, 14(1), 38-50. doi:10.1108/13673271011015552
- Lipnack, J., & Stamps, J. (1997). Virtual teams: Reaching Across Space, Time and Organizations with Technology. *John Wiley and Sons, New York*.
- Maule, A. J., & Edland, A. C. (1997). The effects of time pressure on human judgement and decision making. In R. Ranyard, R. W. Crozier and O. Svenson (Eds.), *Decision Making: Cognitive models and explanations*. London and New York: Routledge.
- McGrath, J. E. (1990). Time matters in groups. J. Galegher, R. Kraut, C. Egido, Eds. *Intellectual Teamwork: Social and Technological Foundations of Cooperative Work*. Lawrence Erlbaum, Hillsdale, NJ. 23-61.
- Mesmer-Magnus, J. R., & DeChurch, L. A. (2009). Information Sharing and Team Performance: A Meta-Analysis. *Journal of Applied Psychology*, 94(2), 535-546. doi:10.1037/a0013773
- Messick, D. M. (1993). Equality as a decision heuristic. In B. A. Mellers & J. Baron (Eds.), *Psychological perspectives on justice. Theory and applications*. New York: Cambridge University Press., 11-31.
- Mishra, S., Deshmukh, S. G., & Vrat, P. (2002). Matching of technological forecasting technique to a technology. *Technological Forecasting and Social Change*, 69(1), 1-27. doi:10.1016/S0040-1625(01)00123-8
- O'Keefe, D. J. (2003). Message properties, mediating states, and manipulation checks: Claims, evidence, and data analysis in experimental persuasive message effects research. *Communication Theory*, 13(3), 251-274. doi:10.1111/j.1468-2885.2003.tb00292.x

- Osatuyi, B., Hiltz, S. R., & Fjermestad, J. (2012). The Impact of Importance and Distribution on Information Exchange in Team Decision Making: Preliminary Results. *IEEE, 45th Hawaii International Conference on System Sciences*. doi:10.1109/HICSS.2012.568
- Paroutis, S., & Al Saleh, A. (2009). Determinants of knowledge sharing using Web 2.0 technologies. *Journal of Knowledge Management*, 13(4), 52-63. doi:10.1108/13673270910971824
- Pedley, P. (1999). Intranets and Push Technology: Creating an Information-Sharing Environment. *Aslib, The Association for Information Management and Information Management International*.
- Perdue, B. C., & Summers, J. O. (1986). Checking the Success of Manipulations in Marketing Experiments *Journal of Marketing Research*, 23(4), 317-326. doi:10.2307/3151807
- Pierro, A., Kruglanski, A. W., & Raven, B. H. (2012). Motivational underpinnings of social influence in work settings: Bases of social power and the need for cognitive closure. *European Journal of Social Psychology*, 42(1), 41-52. doi:10.1002/ejsp.836
- Reimer, T., Reimer, A., & Czienskowski, U. (2010). Decision-Making Groups Attenuate the Discussion Bias in Favor of Shared Information: A Meta-Analysis. *Communication Monographs*, 77(1), 121-142. doi:10.1080/03637750903514318
- Reis, T. H., & Judd, C. M. (2014). Handbook of research methods in social and personality psychology. *Second Edition, Cambridge University Press*.
- Ren, Y., & Kraut, R. E. (2014). Agent-Based Modeling to Inform Online Community Design: Impact of Topical Breadth, Message Volume, and Discussion Moderation on Member Commitment and Contribution. *Human-Computer Interaction*, 29(4), 351-389. doi:10.1080/07370024.2013.828565
- Rutherford, A. (2001). Introducing ANOVA and ANCOVA - a GLM Approach. *SAGE Publications, Inc., California*.
- Scholten, L., Van Knippenberg, D., Nijstad, B. A., & De Dreu, C. K. W. (2007). Motivated information processing and group decision-making: Effects of process accountability on information processing and decision

- quality. *Journal of Experimental Social Psychology*, 43(4), 539-552.
doi:10.1016/j.jesp.2006.05.010
- Schulz-Hardt, S., Brodbeck, F. C., Mojzisch, A., Kerschreiter, R., & Frey, D. (2006). Group decision making in hidden profile situations: Dissent as a facilitator for decision quality. *Journal of Personality and Social Psychology*, 91(6), 1080-1093. doi:10.1037/0022-3514.91.6.1080
- Siemsen, E., Roth, A. V., & Balasubramanian, S. (2008). How motivation, opportunity, and ability drive knowledge sharing: The constraining-factor model. *Journal of Operations Management*, 26(3), 426-445. doi:10.1016/j.jom.2007.09.001
- Stasser, G., & Stewart, D. (1992). Discovery of Hidden Profiles by Decision-Making Groups - Solving a Problem versus Making a Judgement *Journal of Personality and Social Psychology*, 63(3), 426-434. doi:10.1037/0022-3514.63.3.426
- Stasser, G., & Titus, W. (1985). Pooling of Unshared Information in Group Decision-making - Biased Information Sampling during Discussion *Journal of Personality and Social Psychology*, 48(6), 1467-1478. doi:10.1037//0022-3514.48.6.1467
- Stasser, G., & Titus, W. (1987). Effects of Information Load and Percentage of Shared Information on the Dissemination of Unshared Information during Group Discussion. *Journal of Personality and Social Psychology*, 53(1), 81-93. doi:10.1037//0022-3514.53.1.81
- Stasser, G., Vaughan, S. I., & Stewart, D. D. (2000). Pooling unshared information: The benefits of knowing how access to information is distributed among group members. *Organizational Behavior and Human Decision Processes*, 82(1), 102-116. doi:10.1006/obhd.2000.2890
- Steinel, W., & De Dreu, C. K. W. (2004). Social motives and strategic misrepresentation in social decision making. *Journal of Personality and Social Psychology*, 86(3), 419-434. doi:10.1037/0022-3514.86.3.419
- Steinel, W., Utz, S., & Koning, L. (2010). The good, the bad and the ugly thing to do when sharing information: Revealing, concealing and lying depend

- on social motivation, distribution and importance of information. *Organizational Behavior and Human Decision Processes*, 113(2), 85-96. doi:10.1016/j.obhdp.2010.07.001
- Toma, C., & Butera, F. (2009). Hidden Profiles and Concealed Information: Strategic Information Sharing and Use in Group Decision Making. *Personality and Social Psychology Bulletin*, 35(6), 793-806. doi:10.1177/0146167209333176
- Treem, J. W., & Leonardi, P. M. (2012). Social Media Use in Organisations: Exploring the Affordances of Visibility, Editability, Persistence, and Association. *Communication Yearbook*, 36.
- Utz, S., Muscanell, N., & Goeritz, A. S. (2014). Give, match, or take: A new personality construct predicts resource and information sharing. *Personality and Individual Differences*, 70, 11-16. doi:10.1016/j.paid.2014.06.011
- Utz, S., & Steinel, W. (2008). Strategic information sharing: The effects of information sharedness, information relevance and social motivation. *International Journal of Psychology*, 43(3-4), 727-728.
- Van Den Hooff, B. (2012). Why won't you just tell me how it works? Factors affecting knowledge hoarding in organizations. *Paper presented at the annual meeting of the International Communication Association, Sheraton Phoenix Downtown, Phoenix, AZ Online <APPLICATION/PDF>. 2014-06-12 from http://citation.allacademic.com/meta/p552846_index.html.*
- Van Den Hooff, B., & De Ridder, J. A. (2004). Knowledge sharing in context: the influence of organizational commitment, communication climate and CMC use on knowledge sharing. *Journal of Knowledge Management*, 8(6), 117-130. doi:10.1108/13673270410567675
- Van Lange, P. A. M., Otten, W., De Bruin, E. M. N., & Joireman, J. A. (1997). Development of prosocial, individualistic, and competitive orientations: Theory and preliminary evidence. *Journal of Personality and Social Psychology*, 73(4), 733-746. doi:10.1037/0022-3514.73.4.733
- Vuori, V., & Okkonen, J. (2012). Knowledge sharing motivational factors of using an intra-organizational social media platform. *Journal of*

Knowledge Management, 16(4), 592-603.
doi:10.1108/13673271211246167

Webster, D. M., & Kruglanski, A. W. (1994). Individual-differences in Need for Cognitive Closure *Journal of Personality and Social Psychology*, 67(6), 1049-1062. doi:10.1037/0022-3514.67.6.1049

Winquist, J. R., & Larson, J. R. (1998). Information pooling: When it impacts group decision making. *Journal of Personality and Social Psychology*, 74(2), 371-377. doi:10.1037//0022-3514.74.2.371

Witherspoon, C. L., Bergner, J., Cockrell, C., & Stone, D. N. (2013). Antecedents of organizational knowledge sharing: a meta-analysis and critique. *Journal of Knowledge Management*, 17(2), 250-277. doi:doi:10.1108/13673271311315204

Wittenbaum, G. M., Hollingshead, A. B., & Botero, I. C. (2004). From cooperative to motivated information sharing in groups: Moving beyond the hidden profile paradigm. *Communication Monographs*, 71(3), 286-310. doi:10.1080/0363452042000299894